

Chapter 15

Restoration of Philippine Native Forest by Smallholder Tree Farmers

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Abstract This chapter examines how indigenous tree species domesticated by smallholder tree farmers can contribute to the restoration of the Philippine native forests vis-à-vis the popular use of exotic species in many forest plantations. The dominance of exotic tree species in the Philippines is attributed to the following reasons: (a) wide adaptability and tolerance to stress particularly in marginal sites; (b) fast growth and high yield; (c) available research and technological information and; (d) abundance of and access to quality germplasm.

There are mounting interests and experiences in growing indigenous tree species (ITS) as indicated by the planting initiatives documented in various parts of the country. With community-based forest management as a national policy, the role of smallholder tree farmers particularly in forest restoration has become more important than ever. These two developments require important strategies to be put in place to surmount the constraints of, and facilitate the domestication of, ITS namely: (a) prioritizing the ITS by region; (b) increasing the availability of, and improving access to, good quality germplasm which includes seeds, vegetatively-propagated stocks and wildlings; (c) generating farmer-friendly technologies that spans from production to processing; the strategy also includes the appropriate dissemination and adoption of these technologies to the end users; (d) strengthening the use of ITS in biodiversity conservation programs; (e) improving access to market information by tree farmers and establishing close links to the wood market and; (f) reviewing and reforming policies and providing adequate incentives to promote plantation development.

Keywords Forest restoration, indigenous tree species, smallholder tree farms, tree domestication

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15.1 Introduction

The composition of the Philippine flora is estimated to be at least 14,000 species (DENR-PAWB, CI & UP-CIDS 2002). An estimated 3,500 are classified as trees indigenous to the country (Salvosa 1963). Of this number, only 10 percent (≈ 350) is considered economically important (Meniado et al. 1974) with the family Dipterocarpaceae as the prime source of premium hardwood timber for many decades. Lush tropical forests occupy approximately 90 percent or 27M ha of the country's total land area back in the 1500s, prior to the colonization by the Spaniards (Garrity et al. 1993). As of 2000, pristine forest has decreased to 0.8M ha (Acosta 2004) or a loss of almost 97% of the original forest cover. Deforestation peaked at 170,000ha annually in the 1970s while reforestation averaged only at 52,150ha per year (Forest Management Bureau Statistics 2003).

With a staggering loss of forest cover, forest rehabilitation became critically important. The start of reforestation was traced to the pioneering School of Forestry at the University of the Philippines Los Baños (UPLB) in 1910. The Silviculture class made experiments on various methods of replanting areas covered with *Imperata cylindrica* (cogon grass). The pioneering effort of the first forestry school in the country paved the way for the formal government reforestation efforts which started in 1916 in Cebu then quickly spread in other parts of the country. Reforestation saw its full-scale implementation from 1937–1941 with regular government appropriations. World War II wreaked havoc to the nearly 28,000ha plantations (Agpaoa et al. 1976). A revitalized effort was initiated in 1960 with the creation of the Reforestation Administration. Later, private sectors took active part in the reforestation efforts particularly the big logging concessionaires, e.g. Paper Industries Corporation of the Philippines (PICOP) and the Provident Tree Farm Inc. (PTFI) (JOFCA 1996). Recently, a shift from the corporate-based type of forest management to community-based forest management by virtue of Executive Order No. 263 was instituted. Consequently, smallholder tree farmers and people's organization in the uplands became major actors in forest restoration particularly in plantation development.

Plantation forests in the Philippines occupy approximately 7.53 M ha (FAO 2005). Plantations are vital to meet the country's wood demand as stipulated in the Revised Forestry Master Plan for the Philippines (2003) where a target of 460,000ha of commercial plantations is envisioned within 12 years. This chapter examined the trends and patterns in species selection for plantation forestry in the country. It also provided perspectives in the use of indigenous tree species (ITS) particularly by smallholder tree farmers. Lastly, discussions were made on the constraints and limitations besetting the use of ITS and how smallholder tree farmers will be capacitated to contribute to forest restoration using ITS.

15.2 Species Selection in Plantations in the Philippines

Species commonly used in reforestation is surprisingly few considering the abundance of commercially valuable species used by the wood industry. The popularity of exotic trees in the Philippines as a reforestation species dates back when reforestation started early in the 20th century. Data from the Reforestation Division of the Forest Management Bureau (2000) immediately confirms this assertion. Of the top ten species planted in reforestation projects around the country, eight are exotics and only two are ITS (Fig. 15.1). Mahogany (*Swietenia macrophylla*) and gmelina (*Gmelina arborea*) are among the dominant exotic trees planted. Narra (*Pterocarpus indicus*), a common ITS, comes as a close second. Another ITS, agoho (*Casuarina equisetifolia*) ranked seventh among the commonly planted species.

Reports on the plantations of private concessionaires showed a similar pattern: Paper Industries Corporation of the Philippines (PICOP) Resources Inc. (Surigao del Sur Mindanao) have plantations of more than 40,000 ha planted mainly to

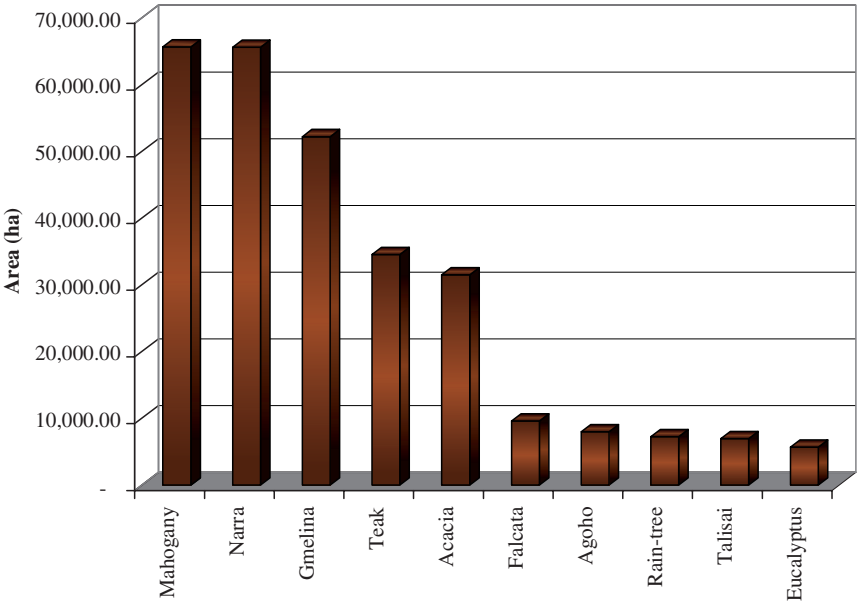


Fig. 15.1 Top ten species planted in reforestation projects in the Philippines, including (from left to right) *Swietenia macrophylla*, *Pterocarpus indicus*, *Gmelina arborea*, *Tectona grandis*, *Acacia* spp., *Paraserianthes falcata*, *Casuarina equisetifolia*, *Samanea saman*, *Terminalia catappa*, and *Eucalyptus* spp. (Forest Management Bureau 2000)

Paraserianthes falcataria, *Eucalyptus deglupta* and *Acacia mangium*. Nasipit Lumber Company (NALCO) (Agusan del Norte) has more than 4,000 ha of exotic plantation. The main species planted are: *P. falcataria*, *G. arborea*, *Acacia auriculiformis*, *A. mangium*, *Pinus caribaea*, *Swietenia macrophylla* and *Tectona grandis*. Provident Tree Farm Inc (PTFI) (Agusan del Sur) has established another 6,000 ha of plantation dominated by exotics like *A. mangium* and *G. arborea* (Ecosystems Research and Development Bureau 1998). The Bukidnon Forest Inc. an industrial tree plantation in Malaybalay (Mindanao) has successfully established 6,367.52 ha of assorted exotic trees. The major species planted are: *A. mangium*, *Eucalyptus urophylla*, *E. deglupta* and *P. caribaea*. Some native species have been tried which includes: *Pinus kesiya*, *Casuarina equisetifolia*, *Lagerstroemia speciosa*, *Pterocarpus indicus* var. *echinatus* and *Shorea contorta*. However, very small areas were allocated for planting these native species. It was claimed that most of the native species are slow growing with high mortalities which increased plantation costs and therefore undesirable to management (Cuevas 1999).

Private tree farms have followed suit and planted mainly exotics. Gmelina and large leaf mahogany are the top choices among private tree farmers. In fact, in Region 2 (northeastern Philippines) all tree farms registered with the Department of Environment and Natural Resources (DENR) were planted to either of the two species. Nationally, the two species are found in all regions. In a study of six regions, it was found out that Gmelina (75 percent or 47 respondents) and mahogany (40 percent or 25 respondents) are indeed the two most popularly planted species. Mangium (*A. mangium*; 38 percent), eucalyptus (37 percent), falcata (*P. falcataria*; 24 percent) and narra (*Pterocarpus indicus*, six percent) are the other commonly planted species in these private tree farms (Carandang 2000).

Another study conducted among 50 smallholder tree nursery operators in Cebu, Bukidnon and Misamis Oriental reinforced the predominant practice of raising exotic trees. Seedlings in the forest nurseries studied were composed of 59 percent timber species, 36 percent fruit trees, and five percent species. Of the timber species being raised, 35 percent are indigenous and 65 percent are exotic. Bagras (*Eucalyptus deglupta*) ranks as the most popular species being raised in 48 percent of the nurseries studied. Other popular species include large leaf mahogany (*Swietenia macrophylla*, 35 percent), *A. mangium* (21 percent), Black wattle (*Albizzia lebekkoides*, 19 percent), *Eucalyptus robusta* (19 percent), *E. torrelliana* (17 percent), narra (*P. indicus*, 17 percent), and yemane or gmelina (*G. arborea*, 15 percent). All, with the exception of narra, are exotics (Tolentino et al. 2001). *Eucalyptus deglupta* is an indigenous species but the local provenances were not used and instead exotic provenances (Papua New Guinea) were planted.

The use of exotic species is not an exclusive silvicultural preference in the Philippines. In Southeast Asia, countries like Indonesia, Thailand and Vietnam have developed extensive plantations of exotic trees like *S. macrophylla*, *P. falcataria*, *A. mangium*, *P. caribaea*, *Eucalyptus* spp, and *Casuarina* spp (FAO Forestry Database). Even in Brazil, another country with active plantation activity, data as early as 1900s revealed an inclination towards the exotic eucalypts over Brazilian timber species (Navarro de Andrade 1941). In fact, as of

2005, Brazil has an estimated 3.2 M ha of eucalyptus plantations (Neto 2005), the exotic species most abundant in that country's plantation program (McNabb 2005).

Exotic trees dominate the country's tree planting program for the following reasons: (1) wide adaptability and tolerance to stress; (2) fast growth and high yield; (3) available researches and technologies and; (4) availability of abundant and superior germplasm.

15.2.1 Wide Adaptability and Tolerance to Stress

An obvious advantage recognized by most foresters and tree farmers planting exotic trees is their versatility especially to unfavorable conditions which are characteristic of many target areas for restoration. The adaptability of exotics to degraded sites (e.g. acidic, low soil fertility, fire-prone areas) and their ability to colonize even marginal grasslands is an attractive feature of these trees that makes them widely planted. As an example, the exotic legumes (e.g. *Acacias*, *Paraserianthes*) are nitrogen-fixing trees that permit optimum growth and development even in nitrogen-depleted soils. Additionally, the wide adaptability of exotic trees enables them to grow in a new environment free from the usual pests and diseases common in its natural habitat (Pryor 1978; Evans 1992) making them almost pest and disease-free at least for the first rotation. *Gmelina* and *A. auriculiformis* are fire resistant and will coppice after a fire. Likewise, their fast growth enables them to compete even with the obnoxious *Imperata cylindrica* (ERDB 1998).

15.2.2 Fast Growth and High Yield

Concomitant with the ability to survive and grow under a wide range of environmental conditions, exotics exhibit exceptionally fast growth and high wood yield. These characteristics make them very attractive for smallholder tree farmers desiring quick income and immediate returns to their investments. Some estimates revealed that the yield of exotics trees ranges from a low of 5 m³ ha⁻¹ year⁻¹ in poor sites to as much as 40 m³ ha⁻¹ year⁻¹ in good sites (ERDB 1998; Table 15.1). However, most of these species exhibit impressive growth yields averaging from 30 to 35 m³ ha⁻¹ year⁻¹. This is almost similar to the average growth performance of *Eucalyptus* species in Brazil which is 20 to 40 m³ ha⁻¹ year⁻¹. Additionally, a phenomenal growth of 75 m³ ha⁻¹ year⁻¹ was accordingly observed (Kageyama 1980 cited by McNabb 2005). In comparison, many indigenous trees are notoriously slow growing making them less attractive to many smallholder tree farmers. In the case of dipterocarps, an important ITS in the Philippines, growth rates vary from different diameter classes ranging from a low 0.44 cm year⁻¹ (10 cm dbh class) and peaking at 0.86 cm year⁻¹ (70 cm dbh class) (Weidelt and Banaag 1982). In

Table 15.1 Summary of the average growth, yield and economic rotation of selected exotic trees (Ecosystems Research and Development Bureau 1998)

Species	Growth		Yield (m ³ ha ⁻¹ year ⁻¹)	Economic rotation (year)
	Height (m)	Diameter (m)		
<i>Acacia mangium</i>	15–30	0.5–0.9	Dry site: 20–25 Good site: 40	Pulp: 6–8 Solidwood: 14–16 Pole: 15
<i>Acacia auriculiformis</i>	8–15	0.4–0.6	10–25	Fuelwood: 3–5 Pulp and paper: 8–10
<i>Swietenia macrophylla</i>	30–40	1.0–1.5	10–20	Solidwood: 17–50
<i>Paraserianthes falcataria</i>	24–30	0.5–1.0	25–35	Pulp: 7–9 Solidwood: 10–15
<i>Eucalyptus camaldulensis</i>	30–40	1.0–1.5	Dry site: 5–10	Dry site: 20–25 Good site: 5–10
<i>Gmelina arborea</i>	20–30	10–15 cm (3 year) 0.6–1.0	Average site: 20–25 Good site: ≥30	Pulp: 6–8 Solidwood: 15–30

Malaysia, dipterocarp plantations registered a maximum diameter increase of 1.22 cm year⁻¹ (Primack et al. 1989). Obviously, these growth rates pale much too far than the popular exotic trees.

15.2.3 Available Researches and Technologies

Most research works have often focused only on a few economically important tree species, thus making available technologies for the plantation development of these species (Hooper et al. 2005) easily accessible to tree growers. Many of these plantation species are exotics grown outside its native range (Zobel et al. 1987). In the case of exotics planted world-wide, e.g. *Pinus caribaea*, *Eucalyptus grandis*, and *Tectona grandis* available research, technology packages and experiences allows many users to plant them with acceptable degree of certainty (Evans 1992). From seed production, planting stock production to appropriate silvicultural treatments as well as successes and failures, information about exotics abound and are accessible to many tree farmers (e.g. Lamb 1973; Chapman 1973; Chapman and Allan 1978; Pryor 1978; International Labour Organization 1979; National Academy of Sciences (NAS) 1980; Boland and Turnbull 1981; Greaves 1981; Jacobs 1981; National Research Council (NRC) 1983; Schonau 1985; Willan 1985; Glover 1987; Midgley 1988; Withington et al. 1988; Boland 1989; Brewbaker 1989; Pryor 1989; Evans 1992; Wadsworth 1997; Schmidt 2000). Information on growth and yield of exotics (e.g. Revilla 1974; Ugalde and Perez 2001) and economics (Sedjo 1984) which are major concerns among tree growers are very much available. Plantation problems like pests and diseases have been examined and published for many exotic trees (e.g. Quiniones 1983; Lapis 1995). In contrast, information for ITS is scanty, fragmented and oftentimes completely lacking.

An average Filipino forester (or even student) will be more familiar with the exotic tree species than of the ITS. Lamentably, even academic programs for many forestry schools and colleges have strong emphasis on exotics. Foresters in the field usually encounter the native species in the scaling station or as cut or processed material but less likely as seedling produced in large quantities in the nursery and much more as plantation crop.

15.2.4 Availability of Abundant and Superior Germplasm

Another obvious advantage of the exotics is the availability of abundant germplasm particularly improved seeds. ICRAF published a tree seed suppliers' directory where several hundred species were included. It is striking that the popular exotics here in the Philippines were among those with the most number of seed suppliers around the world, e.g. *Tectona grandis*, (32) *Acacia auriculiformis* (34) *Gmelina* (31), *A. mangium* (29) and *Swietenia macrophylla* (17) (Kindt et al. 2002). The database lists only formal seed suppliers but informal seed suppliers (local seed collectors and small tree nursery operators) that abound in the country produces or sells mostly exotic species. In one study by the author (Tolentino et al. 2005), informal seed producers in the three major islands commonly sell seeds or seedlings of mahogany, *Acacia*, *Gmelina* or eucalypts. In two studies to be described later (Tolentino 2000a; Tolentino et al. 2001), germplasm availability was clearly identified as the limiting factor for the planting of ITS. The presence of seed periodicity aggravated by few and sparsely scattered mother trees which are mostly located in remote and inaccessible sites would explain this acute shortage of germplasm of ITS. Tree improvement and domestication programs for many of the popular exotics have advanced in many developed countries who have found marketing of improved seeds as a lucrative business. For example, the Australian Tree Seed Center has listed in its website (<http://www.ensisjv.com/atsc>) the availability of improved seeds for 14 different tree species at this time and a few dozen more species in the coming years.

15.3 Initiatives to Promote Indigenous Tree Species

Despite the prevalence of exotic trees in many tree farms and plantations around the country, the planting of ITS is gaining support and popularity. The subsequent sections will describe small and budding efforts to plant ITS in farms or plantations. From these planting programs important lessons on how ITS are propagated and grown in different parts of the country are drawn. Solutions and recommendations that enabled these tree growers to shift to ITS are also explained. Although there are still many obstacles to the growing of ITS, the planting initiatives described below would debunk the criticism that ITS is not grown by tree farmers particularly by smallholder tree farmers.

15.3.1 *The UP Land Grant Experience*

The University of the Philippines (UP) has two land grants (LGs) in the Sierra Madre Mountain Ranges (Laguna and Quezon provinces) covering an area of 10,000 ha. Timber harvesting started in the 1960s and was repeated in the 1980s. It was only in 1989 that legitimate logging was ordered to a halt. Unfortunately, local residents continue to illegally extract timber, make charcoal and gather other forest products (poles, rattan, wildlife). The threat to the remaining forests is exacerbated by the practice of shifting cultivation including the entry of land speculators.

A forest rehabilitation program using indigenous tree species was initiated in 1997. The initial step was the species selection which considered understanding of user needs and preferences, technological opportunities and systematic methods for ranking species (Jaenicke et al. 1995). A modification of species priority setting scheme by Franzel et al. 1996 was used. A series of consultative meetings, mostly informal discussions, were held with approximately 30 upland farmers practicing *kaingin-making* (shifting cultivation) inside the LGs and actual interviews with illegal loggers mostly during the moment when they are apprehended. A total of 61 tree species were identified and initially listed (Tolentino 2000b). Tree species preference based on uses (e.g. lumber, furniture, handicrafts, medicine and food) and market value were ranked (see Appendix). The final list contained tree species mostly used for general construction – a need very common to the local upland communities. The study learned that the preferred species are also those which command good market prices. In addition to the user preference and their marketability, the Land Grant Management included germplasm availability as another criterion. In the end, there were about 20 species included in the trials. All of the species were identified by the participants using the local name. The project management sought the assistance of tree taxonomist to identify the species but a few remained unidentified. The taxonomic identification of many ITS is one of the identified limitations in the use of this class of species.

For the selected species simple experiments accompanied by trial and error procedures were employed to grow them in the nursery and plantation site. A complete description of the results of the nursery and preliminary plantation performance was described in Tolentino (2000 a and b). Below is a summary of these findings for the top eight species planted in a trial of about 20 species.

Most of the fruits and seeds were collected from the ground due to their large size. Seed dormancy expressed as delayed and staggered germination was observed only in Batikuling (*Litsea leytensis*) and talakatak (*Castanopsis philippensis*; Philippine chestnut or wild castanias). All the rest of the species have insignificant dormancy. The findings clarify the belief that not all seeds of ITS are dormant which will be advantageous in the large-scale propagation of these species from seeds in the nursery. On the other hand, dormancy in batikuling and talakatak seeds causes delays and disruptions in nursery production schedules, thus the need to neutralize it. This character, however, becomes advantageous if their seeds are bound for storage. Longer longevity can be maintained even under ambient conditions which will simplify the storage of these species.

Practically no propagation problem was encountered in the nursery except for very slow growth. This was observed in batikuling (*Litsea leytensis*), kuling baboi (*Dysoxylum altissimum*), malaruhut bundok (*Syzygium urophyllum.*), and babay-sakan (ulayan; *Lithocarpus buddii*). These same species were consistently slow in growth even when outplanted. Unlike fast-growing exotic trees like gmelina, acacia and eucalyptus this growth habit makes many ITS less desirable for many tree farmers desiring quick returns. Mix planting ITS with the fast growing exotic species would provide a spectrum of tree age classes. Consequently harvesting regimes will range from short-term to medium to long-term. Developing planting schemes to mix ITS and exotics is an important knowledge gap that researchers need to address. An ecological advantage of the mixed planting scheme is that it can simulate an uneven aged stand which has stratified canopy structure characteristic of tropical rain forests. This canopy architecture optimizes the light intercepted at the various levels and enhances soil erosion protection due to the combined efficiency of the different canopy layers. Economically speaking, the scheme also insulates the tree farmer from the rapidly changing and dynamic wood market and affords him with flexibility in responding to fluctuating product demand and price variations.

Light requirements of the tested species vary both in the nursery and after out-planting. Many require full shade to partial shade in the nursery except for malaruhut. Batikuling and kuling manok (*Aglaia luzoniensis*) can tolerate open conditions when in the sapling stage. This is indicative that these species are mostly shade tolerant which is common to many species in the advance stages of succession. Silvical information like these are vital when designing the planting mix for the slow-growing ITS and fast growing exotics.

The two-year species survival performance is considered good if provided with adequate maintenance, particularly weeding. Survival ranges from 60 to 90 percent especially for potted seedlings. However, one farmer group used bareroot stocks consequently decreasing survival rates to 40 to 50 percent. Rough handling particularly in the difficult terrain of the land grants contributed to seedling shock that decreased outplanting survival. No significant pests or disease problems were encountered either in the nursery or field. A few leaf-eating insects were observed but no serious threats exist. However, since the environment in which these ITS were planted is a mixed secondary forest, it is possible that the presence of a good balance between prey and predator has minimized the occurrence of epidemic-level pest and disease problems. This has strengthened the niche importance for ITS in enrichment plantings for rehabilitating degraded secondary forests. However, Nair (2001) asserts that there is no existing data to support that ITS is not totally resistant to pest outbreak, and an economic damage to ITS plantations is potentially possible. These vital information issues have to be considered when embarking in ITS plantations that make the smallholder tree farm models attractive, avoiding the extensive monoculture plantations common to many exotics.

The program was seriously limited by the availability of germplasm, particularly from superior mother trees. The successive logging operations and the unabated illegal logging activities have significantly decimated the number and distribution

of good mother trees. This dysgenic practice has critically depleted the genetic pools leaving mostly poor quality mother trees or juvenile trees unable to bear abundant fruits and seeds. Additionally, these trees are located in remote and often inaccessible sites making collection extremely difficult. The prevalence of this situation in many parts of the country has significantly decreased the availability of good quality germplasm and is a major debacle in the wide-scale planting of ITS.

15.3.2 *The Mindanao and Cebu Smallholder Nursery Operators Perspective*

The familiarity with ITS was assessed among 50 smallholder nursery operators from Mindanao (Bukidnon and Misamis Oriental) and Cebu (Tolentino et al. 2001). Indigenous tree species (ITS) appeared to be a vague concept or classification of species to most nursery operators. The term “indigenous or native” might be unfamiliar being an English word. However, when some examples were cited, the respondents readily enumerated what they thought were indigenous trees. It was noted that commonly and widely planted species like eucalyptus, *Swietenia* sp. and gmelina were frequently mistaken as indigenous due to their abundance and prolonged period of plantings. Ninety-one species were identified by the nursery operators. Familiarity was simply gauged by the number of times an ITS was mentioned. Molave (*Vitex parviflora*) was the most popular among the respondents followed by Lauan (which is the generic name for dipterocarps by local people) followed by narra (*Pterocarpus indicus*) and bagalunga (*Melia dubia*) and a species locally known as katii and ulayan (Philippine oak, possibly *Lithocarpus* spp.). This result including that of the UNDP project to be described later clearly show that ITS are not foreign or unknown to many local upland communities. Thus, promotion in the various planting activities using ITS will be facilitated due to the current awareness or knowledge of the local people.

Lumber and furniture species top the list of uses identified for ITS, again confirming the preference of local people for wood construction and highly marketable species. Most respondents cited several uses of the species. The findings indicate that ITS have tremendous potentials recognized by the communities. They have also expressed willingness to plant the ITS in their agroforestry farms. The same study found out that upland farmers have interests and are willing to raise ITS in their nurseries. However, the interest and willingness hinge on several factors with the availability of good germplasm being the most important (51 percent). Obviously, any planting program will require the supply of good germplasm. As earlier described, this has been an important advantage that exotic species possess over the ITS. Additionally, local people have difficulties in identifying ITS wildlings (13 percent) if this germplasm source will be used (Table 15.2). There were a few who still prefer exotics or fruit trees due to slow growth of ITS (eight percent), better markets for exotic trees (eight percent) and restrictive policies on harvesting and transporting of ITS (five percent).

Table 15.2 Explanatory factors for raising indigenous tree species in forest nurseries in Cebu, Lantapan (Bukidnon) and Claveria (Misamis Oriental)

Responses	Total
Limited supply of seeds and planting materials	38
Difficulty with ITS identification	10
Fast growth rate for exotics; slow growth rate for ITS	6
Complicated permit and transport system for ITS	4
Financial difficulties in raising ITS	4
Farmers' preference for fruit trees	3
Interest in planting ITS if there are buyers	2
Perception of ITS as a common plant on the farm	1
Preference for mix planting of exotics and ITS	1
Pejorative mentality of raisers	1
Production of ITS for "testing" only	1
ITS as food for wildlife	1
Knowledge of other ITS yet these are absent	1
Lack of technical know-how in raising ITS	1
Total responses	74

n = 50

Note: Some respondents gave more than one response

15.3.3 *Community-Based Production System for Selected Trees and Vines in Support of the Furniture and Handicraft Industries*

Currently, the author is conducting a research, "Community-based Production System for selected Trees and Vines in support of the Furniture and Handicraft Industries" in Quezon and Diffun provinces. The Gabriela MultiPurpose Cooperative Inc (GMPCI), a community-based forest management agreement (CBFMA) holder with the Department of Environment and Natural Resources was chosen as the project partner. The People's Organization (PO) is currently testing the following ITS: bagalunga (*Melia dubia*), mamalis (*Pittosporum pentandrum*) and malapapaya (*Polycias nodosa*). Though the species were not familiar to the PO, the researchers observed that the farmers were willing to learn and test new tree species that they thought will contribute to their income. Based on their prior knowledge and experience in raising *Gmelina arborea*, also popular as exotic tree in that region, the farmers quickly tested a variety of methods in breaking seed dormancy of the three new species. The project also documented that these farmers are comparing the new ITS with the exotic gmelina thus, in the site selection for the ITS, similar sites where gmelina was grown were used. Likewise, growth and performance were gauged with gmelina as standard and they have observed that the exotic and ITS were comparatively similar. Tree management like site preparation, maintenance and protection works were patterned to their previous tree farming practices for gmelina.

One year seedlings range in height from 40 to 150 cm, while their diameters vary from 9 to 66 mm. Two fires broke out in the area due to escaped fires from adjacent cornfields and burned several seedlings. However, the ensuing rainy season revealed that both *Polycias nodosa* and *Pittosporum pentandrum* have the ability to re-sprout after the fire. This impressive growth performance and fire resistance of the ITS have impressed even the farmers who are very much convinced of the superiority of gmelina. The general criticism that ITS are slow growing and unable to colonize marginal sites is now a highly debatable statement. These initial results clearly manifest that useful information about ITS should be discovered by researchers in order to provide a basis for future wide-scale plantings. On the other hand, the absence of packaged technologies for particular species will not necessarily hinder the planting of previously unknown ITS. However, like many new and introduced tree species, the processing, utilization and markets aspects are major concerns for these farmers.

15.3.4 Facilitating Community-Based Conservation and Planting of Indigenous Trees in Misamis Oriental and Bukidnon

The UNDP Small Grants Programme for Operations to Promote Tropical Forest (UNDP SGP PTF) funded a project entitled “Facilitating Community-based Conservation and Planting of Indigenous Trees” in Misamis Oriental and Bukidnon. The project was implemented by the Landcare Foundation of the Philippines with the Landcare Associations in the two provinces. The participants were mainly composed of indigenous people (Higa-onons and Tala-andigs). The Project reported that for the four barangays (villages) where the project was implemented, the community members were able to list several dozen ITS in their area including their uses, location of mother trees where seeds and wildlings were collected, specific niches of mother trees in the landscape, and flowering and fruiting periods (UNDP SGP PTF 2006). Community members were clearly familiar with the ITS in their locality. The project illustrated the rich information lodged among local indigenous people and the need to externally pump-prime similar projects that will stimulate the use of indigenous knowledge systems in plantation development. The use of seeds and wildlings as sources of germplasm demonstrated the ability of these people to cope with the issue of limited planting materials.

15.4 Capacitating Smallholder Tree Farmers to Domesticate Indigenous Tree Species

The potential of domesticating a variety of ITS by smallholder tree farmers in the Philippines is undeniably tremendous. With the shift in forest management from purely corporate-based to community-based forest management, as mandated by Executive Order No. 263, restoration of native forests by smallholder tree farmers is a viable alternative. There are 4.9 million hectares under CBFMA (Community-based Forest

Management Agreement), 20,000ha tree farms and 94,000ha under agroforestry leases (Forest Management Bureau Statistics 2003). Assuming that even 10 percent of these areas will be devoted to the planting of ITS, it still represents an enormous **500,000ha!** This is even more than the targeted plantation area identified in the Revised Forestry Master Plan. Devoting portions of this area for timber production is important in order to contribute in lessening the current wood product importation amounting to US\$162.9 million (Forest Management Bureau Statistics 2003). With appropriate investment climate and incentives, stable market, appropriate technologies, supported by policies friendly to smallholder tree farmers, domesticating ITS has bright prospects in restoring the Philippine native forests. The discussion below includes both a number of constraints that affect the planting of ITS and a number of recommendations that will capacitate smallholder tree farmers to plant ITS in their farm lots.

15.4.1 Prioritization of Potential ITS

The ITS for potential use in upland farms are so diverse and numerous that developing technologies for each species is virtually impossible. It is imperative that technical experts, local communities, indigenous people, wood industry officials, concerned government officials and other key stakeholders in the uplands meet and discuss together to identify the ITS that will be most useful and promising in their respective regions. The prioritization procedure is founded on the basic principles of tree domestication that is farmer-led and market-driven process. A more detailed procedure for setting priorities for multipurpose tree improvement was described by Franzel et al. (1996). The scheme provides science-based practice for species priority setting. This exercise will significantly cut down the long list of ITS and must be done for each of the biogeographic regions. Unfortunately, even for the national tree planting program, the priority listing of species seemed nebulous. Consequently, the vague direction weakens the various initiatives and efforts in plantation development.

Some regions in the Philippines have initiated studies and prioritization, e.g. Region 10 (Northeastern Mindanao) has published a list of Indigenous Tree Species in the region which includes 195 tree species (Anonymous 2002). In an unpublished material from DENR Region 8, (Eastern Visayas), the Ecosystem Research and Conservation Division has actively investigated potentially valuable ITS in the region. From the aforementioned lists, stakeholders can develop a consensus on the priority ITS that tree plantation developers can select from.

15.4.2 Increase Availability of and Improve Access to Quality Germplasm

Subsequently to species prioritization, the supply of quality germplasm is the next step in the production system of ITS. Support for planting ITS can be increased if the government and the private sectors or upland organizations will spearhead the production and distribution of quality ITS germplasm. Genetically diverse and

superior sources of the selected species must be identified and conserved. It is not enough that seeds or seedlings are supplied to the farmers. The germplasm must be of superior quality. Many farmers' hopes have been crushed when the promise of millions in income did not materialize because the germplasm used was inferior and the resulting trees grew considerably less or were below market standards. Initiatives to address this critical need are not totally lacking.

In Lantapan, the Agroforestry Tree Seed Association of Lantapan (ATSAL), through the assistance of ICRAF (World Agroforestry Centre), found the seed and seedling business a market niche among the upland farmers. After developing the required appreciation for quality germplasm, the organization, which grew in membership and scope, has reportedly earned PhP 2 million (US\$44,444) since its start in 1998. The organization has gained popularity in the Visayas and Mindanao region as a major source of agroforestry germplasm which includes both indigenous and exotic species.

The Mt. Apo Farmers Cooperative (MAFAMCO) is another people's organization that markets agroforestry seeds in Mindanao (Bansalan) through the Mindanao Baptist Rural Life Center (MBRLC). Originally, a seed business organization, it has now expanded into credit and merchandizing (Palmer 1999). However, it is not clear whether the organization is making rigid and strict selection of seed sources like ATSAL.

In another study (Tolentino et al. 2005), a village along the highway of Diadi, Nueva Vizcaya has engaged in the seedling production business mainly for exotic trees like gmelina, mahogany and acacia. However, a few of them were found to be producing ITS like dipterocarps, *Vitex parviflora*, *Dracontomelon dao*, and *Agathis philippinensis*. Accordingly, there are some demands for this species from customers coming from different parts of the Luzon Island. Interestingly, the exotics are priced much lower than the ITS. Seedlings of exotic species are sold at PhP 2 to PhP 5 (US\$0.05 to US\$0.10) a piece while the ITS ranged from PhP 20 to PhP 50 (US\$0.40 to US\$1.0) per seedling. Difficulties in the collection and limited sources of the ITS are the reasons for the price difference.

The Haribon Foundation, an NGO dedicated to the conservation of biodiversity in the Philippines, has also listed 10 nurseries around the country producing indigenous tree seedlings (www.haribon.org.ph/?q=node/view/367).

The existence of informal seed and seedling producers of ITS is a clear indication that with the demand for quality germplasm, upland organizations can respond to the needs. However, with vast hectares to be planted in the uplands, this may not be sufficient. Other sectors have to come in and beef-up the efforts of providing quality germplasm. Additionally, information about the existence of seed and seedling producers, and how to contact them, is not widely publicized. A national directory of small and informal seed and seedling producers will be an important piece of information for many tree growers searching for ITS germplasm. A simple seed and seedling directory is currently being prepared from the study by Tolentino et al. (2005).

Other sources of planting stocks are needed to complement the shortage of seeds of many ITS. This will include vegetatively reproduced stocks and wildlings.

Asexual propagation, particularly of recalcitrant species and those with seed periodicity (e.g. dipterocarps) is a good alternative source of germplasm materials. For example, Pollisco (2006) described propagating dipterocarps vegetatively employing IBA as rooting hormone in a non-mist sand propagating system. In another study, cuttings of 15 dipterocarp and premium hardwood species were propagated in a mist and non-mist system with varying degrees of success (Dimayuga and Pader 2006). Regional offices of the Ecosystems Research and Development Service (ERDS) have established hedge gardens of many dipterocarps and some premium hardwoods. The main ERDB office at UPLB has a significant collection of these species (Pollisco 2007). An emerging propagation technology for the mass propagation of cuttings of dipterocarp is the KOFFCO system (Komatsu-FORDA Fog Cooling system) tested for cuttings of 36 indigenous dipterocarps species in West Java, West Kalimantan and East Kalimantan (Subiakto et al. 2005). Its possible application for the Philippine dipterocarps may be explored.

Protocols for tissue culture of ITS are having some headway with the development of protocol for micro-propagation of bagras (*Eucalyptus deglupta*) plantlets using explants from selected mature genotypes (Capuli and Calinawan 1999). Another researcher has also successfully developed the mass propagation of *Endospermum peltatum* Merr through tissue culture (Quimado and Umali-Garcia 1997). In Malaysia, they have successfully micropropagated *Shorea leprusola* using a temporary-immersion technique, the RITA system (Kandasamy et al. 2005) which may find possible application for the Philippine dipterocarp species.

Wildlings are another potential source of quality germplasm, but with limited natural forests, they may be hard to find. Additionally, the possible sources of these wildlings are located in protection forests where gathering of wildlings is strictly regulated. For remote sources, transporting shock is a serious threat that results in high mortality. A solution to this was developed by Pollisco (2006). Wildlings are protected from desiccation during collection by placing them in large polyethylene plastic bags (62×25 in.) with small amounts of water. Upon reaching the nursery, the wildlings are immediately potted and placed for about two months in an airtight wildling recovery chamber.

The policies on silvicultural treatments to existing trees in protected areas where wildlings are collected are nebulous except for a blanket policy that no cutting or logging is permitted. There is a necessity to revise policies to designate germplasm production areas in protected areas where silvicultural treatments such as thinning of competing trees, girdling and fertilization of potential mother trees are allowed, including regulated collection of wildlings, to increase fruit and seed production.

15.4.3 Generation of Farmer-Friendly Technologies

Information and technologies about ITS are either limited, fragmented or non-existent. This was confirmed through an analysis of available information about ITS (Tolentino 2000b; Tolentino 2003). The comprehensive tree species selection and

reference guide Agroforestry Database (Salim et al. 2002) listed 43 tree species native to the Philippines. Of these 43 species, 28 species have good and sufficient information about propagation methods (65.1 percent). This is adequately complemented by equally good information about tree management (60.5 percent or 26 spp). On the other hand, only ten species are provided with good information about germplasm management whereas for 30 species this information is limited. Natural habitat is next with limited information for most species (27 species; 62.8 percent). A close third is pests and diseases (limited information for 26 species; 60.5 percent) followed by reproductive biology and history of cultivation (limited information for 21 species; 48.8 percent). Finally, various species lack any information in one or more of the following themes: history of cultivation, pest and diseases, germplasm management, tree management, natural habitat, biophysical limits, reproductive biology and propagation methods. Based on functional use, the native species are obviously multi-use or multi-service tree species. The matrix analysis also provided some interesting observations regarding the way other countries plant these native species. *Barringtonia racemosa* (apalang) is solely found in the Philippines, but 32 other places plant it as an exotic species. Another species, *Artocarpus altilis* though native to three other places is planted in another 51 countries or major islands. Several of these native tree species have wide exotic distributions (>20 countries/ places), namely: *Albizia procera*, *Aleurites moluccana*, *Flemingia macrophylla*, *Lawsonia inermis*, *Sennasiamea*, *Sesbania grandiflora*, and *Syzygium cumini*. This proves that it is not only the Philippines that have a proclivity for exotics.

In tree domestication researches on appropriate seed, nursery and plantation technologies for the prioritized species are conducted on-station and on-farm levels to insure that the production technologies will be acceptable and affordable to the upland farmers. Tree domestication is farmer-led thus the old paradigm of purely researcher-generated technologies for the uplands must be complemented by this new paradigm. Farmers can play an active role in the planning, implementation, management, monitoring and evaluation of the smallholder tree farm programs. Incorporation of indigenous knowledge, when available, is another viable step. The UNDP Project cited earlier reinforces this recommendation. CBFM sites with strong community participation are ideal areas for researches of this nature. Various community-based researches are in existence and the author is currently involved in one of those (Quirino study cited earlier).

Another problem that needs to be addressed by researchers will be improved planting stock production. In one study, quality of the many nursery stocks in smallholder nurseries was found to be generally low (Tolentino et al. 2001). Root-shoot ratios were low, many roots were defective and quite a number were overgrown. Recommendations were made to improve the production of plantings stocks namely: availability of improved or quality sources of germplasm, applications of root pruning, use of alternative containers (e.g. root trainers), development of appropriate nursery stock quality assessment, and promotion of the use of composts. Since operators of these smallholder tree nurseries are resource-limited, assistance on training and logistical support is necessary. Other technological aspects needing specific information for ITS are on proper site selection, appropriate tree management and sustainable harvesting system.

Active participation of the smallholder tree farmers is critical in the development of appropriate production model. Considering the diverse conditions, options, limitations and stakeholders present in various regions of the country, a generalized pattern for species planting, species mix or combination is difficult to make for all the smallholder tree farmers in the Philippines. The challenge to evolve site and locality-specific domestication strategies for ITS is clear and imperative. However, the scale of production from a particular species in a locality must be economically feasible to support the wood processing requirements in that area. Wood industries normally require large-scale plantations as reliable sources of raw materials for their processing plants. The shift to the community-based forest management, demands models of smallholder tree farms aggregated together as a confederation large enough to sustainably supply the needs of wood processing plants using ITS. Additionally, upland farmers rarely plant trees in blocks (boundary or contour planting), thus models or schemes which integrates the ITS in the agroforestry farm that respond to market requirements and demands while at the same time addressing the farmers limitations and their livelihood options are critical research questions.

Enrichment planting technologies are already available but prioritizing ITS in enrichment plantings particularly in CBFM projects is an important move. Accomplishments of the community-based projects with Assisted Natural Regeneration (ANR) and Timber Stand Improvement (TSI) components with funding from Asian Development Bank (ADB) and Japan Bank for International Cooperation (JBIC) revealed that most of the species planted are the fast growing exotic species, e.g. *Gmelina arborea*, *Swietenia macrophylla* and *Gliricidia sepium*. *Pterocarpus indicus* is the only indigenous tree species commonly used by the POs (NFDO 2003). This ground reality is quite off tangent to existing policies of DENR, e.g. DENR Memorandum Circular No. 20 Series of 1990 (Guidelines on the Restoration of Open and Denuded Areas within National Parks and Other Protected Areas for the Enhancement of Biological Diversity) and DENR Administrative Order No. 32 Series of 2004 (Revised Guidelines on the Establishment and Management of Community-based Programs in Protected Areas) which prescribes the planting of indigenous and endemic species for these particular areas.

Dipterocarp pilot plantations have been established by DENR Regional Offices all over the country by virtue of DENR Administrative Order No. 21 Series of 1996. Pollisco (2007) provided information regarding the distribution and accomplishments of this particular directive. On average, most regions established and maintained around 100 ha of dipterocarp plantations with Region 7 (Central Visayas) topping the list with more than 600 ha. Key lessons from these plantations have not been widely disseminated to allow wide replication of this notable endeavor. Despite, these seemingly impressive accomplishments, these pilot plantations are still significantly less than the existing exotic plantations.

Another innovative approach employing indigenous tree species that could be emulated is the Rainforestation Farming pioneered at the Leyte State University (now Visayas State University) in Eastern Visayas. The Project combines the elements of sustainable rural development, conservation of remaining primary forests

and natural resources and biodiversity rehabilitation (Göltenboth 2005) and specifically employs indigenous tree species in its planting programs. The details of planting and maintenance scheme which includes indigenous pioneer trees (e.g. *Samanea saman*, *Artocarpus blancoi*, *Melia dubia*, *Casuarina nodosa*), indigenous shade loving trees (e.g. *Dipterocarpus validus*, *Shorea contorta* and *Litsea leytensis*) and fruit trees (e.g. *Artocarpus heterophylla*, *Nephelium lappaceum*, *Garcinia mangosteen*, *Durio zibethinus* and *Sandoricum koetjape*) were described by Göltenboth (2005). The project reported about 1,500 ha under long-term trials using this mode of farming in the islands of Leyte, Bohol, Palawan and Mindanao involving subsistence farmers and farmer cooperatives (EURONATUR 2002).

Technologies for wood processing and post-harvest practices suitable for the production models of the smallholder tree farmers are required to assist farmers to efficiently process their trees. There is a need for small sawmills for the processing of small diameters and volumes of wood that are grown in most smallholder tree farms. Farmers need post-harvest technologies to minimize losses due to poor handling and storage. This will include wood drying and, if necessary, wood preservation technologies.

The experience of Landcare in the Philippines highlights how farmer participation was promoted to adopt soil conservation measures. Although in another realm, these principles appear to be a good model to follow when generating technologies for the domestication of ITS by the smallholder tree farmers (ACIAR 2004; ACIAR 2003).

Appropriate and aggressive dissemination of technologies is part of the technology generation program. Data banking of relevant information for ITS is vital to widespread dissemination. The Agroforestry Database was developed by ICRAF and is already on its second version. The database contains both exotic and indigenous tree species. The Department of Forestry, Leyte State University (now Visayas State University) is using software called ALICE which accordingly stores information for ITS (Mangaoang, E.O., 1999). Both of these databases are undergoing regular improvements and updates. It is also recognized that many information and data have not been integrated into these existing databases and are just in some libraries, research offices or in the communities. Thus, there is an obvious need to gather, collate, analyze and validate the information before their inclusion in the data banks. Knowledge management of these sources of information is critical to facilitate adoption of the technologies by the smallholder farmers. More importantly, this information should be easily accessible to the end users.

15.4.4 Strengthening the Use of ITS in Biodiversity Conservation Programs

Indigenous tree species will find a good niche in the proposed biodiversity corridors as advanced in the National Biodiversity Strategy and Action Plan (Department of Environment and Natural Resources-Protected Area and Wildlife Bureau) (DENR-PAWB), Conservation International (CI), & University of the Philippines-Center

for Integrative and Development Studies (UP-CIDS), 2002. In these corridors, planting of so-called keystone species will make good use of ITS. Keystone species are those indispensable species which control the structure of the community and help determine which other species are present. While we still lack information on what are those keystone species, it is undeniable that these are ITS which provides the food for and habitat requirements of wildlife or are the associated species of other trees in the forest. The aforementioned Rainforestation Farming utilizes pioneer species which are potentially keystone species.

The Framework Species Method pioneered in Chiang Mai, Thailand utilizes the so-called framework species in forest restoration of degraded sites. These species are defined as *indigenous, non-domesticated forest tree species, which, when planted on deforested land, help to re-establish the natural mechanisms of forest regeneration and accelerate biodiversity conservation*. The method “re-captures” the site by shading out the herbaceous weeds, establishes a stratified crown system, restores ecosystem processes and improves microclimatic conditions for the establishment of new regenerations. The framework species provide bird perches, habitat and food for seed dispersing animals that will enhance natural regeneration in the area (FORRU 2005). This approach can likewise be modified for application in the Philippines particularly in designated protected areas.

ITS in protection forests may have enormous potential for carbon sequestration as revealed by the fast growth performance of several ITS. Since many of these ITS are long-lived unlike their exotic counterparts, their ability to store carbon for longer periods presents another important role of ITS in mitigating climate change.

15.4.5 Market Information and Links

Farmers have always complained of poor markets for the crops (either agricultural or trees) raised in their upland farms. Correct market information particularly the seasonal demands, price fluctuations, product specifications or standards, existing or potential competitors (both direct or substitute), attendant risks, are vital information the farmers need to know. It might even be worthwhile that the people's organizations have an honest-to-goodness discussion with potential buyers who will directly provide information about their wood requirements and the prices they are willing to pay. Assistance in linking them to the potential buyers or market will be crucial in the farmers' decision to raise ITS species. This should be linked with the earlier discussion on species prioritization.

ITS absorption by the wood processing industry or the wood market is critical in the production chain. Undeniably, the ITS were the species that the wood industry was processing during the start of the logging era except that the trees were naturally-grown and of bigger diameters. Improved technologies for processing of plantation-grown smaller diameter trees are important imperatives to allow the market for ITS to expand and develop.

The case of malapapaya (*Polycias nodosa*) in Gumaca, Quezon is an example on how ITS was promoted due to market forces. A processing plant which manufactures chopsticks, popsicle sticks, veneer and bento box (Japanese lunch box, a good substitute for styrofoam boxes) buys naturally-grown malapapaya trees from the area. The presence of this market has encouraged the planting of the species in the area. However, while planting has increased, production technology particularly of planting stocks is not fully perfected. The Ecosystems Research and Development Bureau and the company (MP Woods Inc.) have partnered together to conduct production technology research for the species, but the technology has not reached the smallholder tree farmers.

15.4.6 Policy Review and Reforms Coupled by Incentives for Plantation Development

The Director of the Forest Management Bureau himself admitted that *the development of private industrial forest plantations has not progressed well despite the incentives provided and the prescriptions of the Philippines Forestry Master Plan* (Acosta 2004). He enumerated the factors that hinder forest plantation in the Philippines namely: (a) financial viability of plantation development; (b) security of land tenure; (c) unstable forest policies (changing personnel who do not honor previous commitments between government and investors).

Resource-limited farmers are always plagued by the lack of capital to finance even the most essential components of their agroforestry farm. Financial assistance at reasonable interest rates would augment the farmers' meager resources. However, most upland farmers are non-bankable, i.e. practically no bank is willing to extend credit to the tree farming business of this sector of the society. High risks associated with environmental problems and low repayments are the major reasons. It would be better if the farmers' organization itself will be the one to apply for credit.

The short land tenure scheme currently offered by the government (25 years renewable for another 25 years) does not encourage plantation investors to put in their money to tree farming. The private sector is suggesting a tenure security close to private ownership or if possible complete privatization of state forest lands (Acosta 2004).

The same paper on plantation incentives (Acosta 2004) suggested the following actions to tap into the potential of CBFMs for plantation development: (a) *full rationalization of forestry rules and complete devolution of forest management functions to communities and people's organizations*; (b) *Research and development and extension support to CBFM and*; (c) *strengthening the financing and market links between corporate forestry entities and CBFM organizations*. Furthermore, he proposed the re-evaluation of the present ban on export of logs and rough lumber from the natural forests and deregulation of harvesting, transport and trade of plantation timber.

Another paper on financial and other incentives for plantation establishment contends that financial incentives are effective but needs supporting policies and

conditions to be successful (Williams 2001). He suggested indirect incentives like research, training, extension and market information instead of the usual direct government subsidies.

On the regulatory side, special permits are required to harvest and transport certain indigenous tree species particularly premium hardwood species. DENR Administrative Order No. 78 regulates the cutting of several premium hardwood species to specific areas and amounts only. In private lands, a special private land timber permit (SPLTP) has to be secured for the purpose of harvesting and transporting the planted trees. Almaciga (*Agathis philippinensis*), on the other hand, is totally banned from cutting in any part of the country as per DAO No. 74 series of 1987. No regulative problems will be encountered in the planting operations except some registration procedure, but the difficulties will arise when these trees reach harvesting age. For the ITS, volumes less than 10m³ are approved for cutting and transporting by the Regional Executive Director of the Department of Environment and Natural Resources (DENR; not CENRO or PENRO at, respectively, the municipal and provincial administrative levels). Volumes in excess of this amount will have to be approved by the DENR Secretary. A smallholder tree farmer or owner of a private land may not have the patience, time and resources to secure the necessary special permit from the DENR Regional or Central Office. Exotic trees when harvested are not subject to similar stringent regulations. Instead of going hard on illegal loggers of premium hardwoods from the natural forests, these policies have created an environment that tend to discourage the massive planting of these ITS and have spawned conditions that favor the planting of exotic trees. The deregulation of plantation timber described above is supported by this analysis. Obviously, a revision of these “anti-ITS” policies have to be instituted to encourage the planting of ITS.

Simplification of policies governing the establishment, harvesting and transport of ITS from CBFM and private tree farms will facilitate the procedures that these farmers have to go through during the harvesting and transport of their produce. The current cumbersome and bureaucratic process discourages many farmers from engaging in ITS planting. The Forestry Development Center of the CFNR-UPLB has recently completed a study towards the simplification of rules, regulations and procedures of DENR.

15.5 Conclusions

Philippine reforestation efforts dating back in the early 1900s are characterized by the dominant planting of exotic tree species. Reasons for their widespread use include: (1) wide adaptability and tolerance to stress; (2) fast growth and high yield; (3) accessible information and technologies and; (4) availability of abundant germplasm, particularly improved seeds. Despite this apparent edge over the indigenous tree species, ITS still has a niche to occupy in Philippine forestry particularly for forest restoration by smallholder tree farmers. Experiences and interests on ITS are

emerging as manifested in the planting initiatives described in the UP Land Grants, Quirino, Mindanao and other parts of the country. There are fast growing and stress-tolerant ITS that have comparable performance in marginal sites like the exotic trees. Limited germplasm, particularly seeds, is complemented by the collection of wildlings from adjacent natural forests, a coping mechanism by resource-limited farmers. Propagation and tree management of these ITS are not very complicated and difficult despite the absence of intensive researches like their counterpart exotics. In some sites, indigenous knowledge has played a major role in addressing the lack of formal research studies needed as basis for technological practices.

The current national thrust on community-based forest management highlights the potential contribution of smallholder tree farmers in forest restoration. Familiarity with the ITS among upland dwellers is high which can facilitate widespread domestication. However, there are important strategies that needs to be put in place to facilitate the domestication of ITS. These are: (a) the need to prioritize the ITS by region to limit the list to the potentially useful and marketable species; (b) increase the availability of and improve access to good quality germplasm; this involves the use of the traditional seeds complemented by vegetatively-propagated stocks (macro and micro) as well as wildlings; (c) generation of farmer-friendly technologies that spans from production to processing; indigenous knowledge is useful when available; the strategy also includes the appropriate dissemination and adoption of these technologies to the end users; (d) strengthening the use of ITS in biodiversity conservation programs; (e) improving access to market information by tree farmers and establishing close links to the wood market and; (e) policy review and reforms coupled by adequate incentives to promote plantation development.

There are existing policies and programs that clearly support the planting of ITS in the various forest restoration programs of the country. However, there are certainly big hurdles that need to be surpassed but with a resolute stand to bring back the Philippine native forests, foresters, smallholder tree farmers and private land owners can unite to restore the lush tropical forests. A last note, this paper does not advocate a complete shift from exotics to purely indigenous trees but offers a pragmatic approach to species selection which aims to provide the best options for the benefit of the people and the society who depend on the Philippine forests. Similar to exotic species, indigenous tree species offer immense potentials that remain to be tapped by many tree growers both for production and environmental services.

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Appendix: Indigenous Tree Species with Potentials for Plantation Forestry Identified and Classified by Local Residents in Areas Covered by the University of the Philippines Land Grants

Priority level	Scientific name	Use
1	<i>Pterocarpus indicus</i>	Furniture
1	<i>Aglaia luzoniensis</i>	General construction, furniture
1	<i>Diospyros philippensis</i>	General construction, furniture
1	<i>Litsea leytensis</i>	Handicraft
2	<i>Shorea negrosensis</i>	General construction
2	<i>Callophyllum</i> spp.	General construction, furniture
2	<i>Shorea squamata</i>	General construction, handicraft
2	<i>Shorea contorta</i>	General construction, handicraft
2	<i>Shorea polysperma</i>	General construction, handicraft
2	<i>Dehaasia triandra</i>	General construction
2	<i>Parashorea malaanonan</i>	General construction, handicraft
2	<i>Dracontomelon dao</i>	General construction, furniture
2	<i>Litsea</i> spp.	General construction, handicraft
3	<i>Dysoxylum octandrum</i>	General construction
3	<i>Hopea foxworthyi</i>	General construction
3	<i>Dillenia philippinensis</i>	General construction, furniture
3	<i>Alstonia macrophylla</i>	General construction, furniture, medicine
3	<i>Syzygium</i> spp.	General construction, furniture
3	<i>Palaquium merrillii</i>	General construction
3	<i>Dipterocarpus grandiflorus</i>	General construction
3	<i>Anisoptera thurifera</i>	General construction
4	<i>Alstonia scholaris</i>	General construction
4	<i>Endospermum peltatum</i>	Handicraft, frame
4	<i>Agathis philippinensis</i>	Furniture
4	<i>Sandoricum vidalii</i>	General construction, furniture, handicraft
4	<i>Syzygium</i> spp.	General construction, furniture, food
5	<i>Glochidion triandrum</i>	General construction
5	<i>Artocarpus Blancoi</i>	General construction
5	<i>Cinnamomum mercadoi</i>	General construction, furniture, medicine
5	<i>Dysoxylum altissimum</i>	General construction, furniture
6	<i>Buchanania arborescens</i>	General construction
6	<i>Cratoxylum Blancoi</i>	General construction
6	<i>Melicope triphylla</i>	General construction
6	<i>Canarium asperum</i>	General construction
6	<i>Diplodiscus paniculatus</i>	General construction
6	<i>Mussaenda philippica</i>	Fuel/charcoal, construction
6	<i>Polycias</i> spp.	General construction
6	<i>Myristica philippensis</i>	General construction
6	<i>Artocarpus ovata</i>	General construction
7	<i>Teijsmanniodendron aherianum</i>	Fuel/charcoal, handles
7	<i>Kibatalia gitingensis</i>	Furniture, handicraft
7	<i>Diospyros pilosanthera</i>	General construction, furniture
7	<i>Symplocos villarii</i>	General construction
7	<i>Ormosia grandifolia</i>	General construction

(continued)

(continued)

Priority level	Scientific name	Use
8	<i>Endospermum peltatum</i>	White lumber
8	<i>Ficus baletae</i>	White lumber
8	<i>Ficus variegata</i>	White lumber
8	<i>Macaranga tanarius</i>	Fuel/charcoal
8	<i>Pterocymbium tinctorium</i>	Wooden footwear
9	<i>Lithocarpus buddii</i>	Fuel/charcoal
10	<i>Castanopsis philippensis</i>	Fuel/charcoal, food